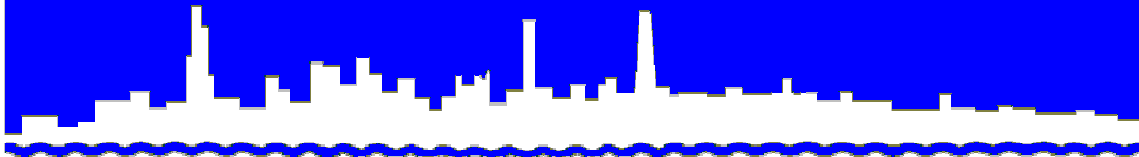


*Protecting Our Water Environment*



***Metropolitan Water Reclamation District of Greater Chicago***

***MONITORING AND RESEARCH  
DEPARTMENT***

***REPORT NO. 09-25***

***MICROBIOLOGICAL REPORT OF  
BYPASS SAMPLES IN 2008***

***April 2009***

**Metropolitan Water Reclamation District of Greater Chicago**  
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MICROBIOLOGICAL REPORT OF  
BYPASS SAMPLES IN 2008

Monitoring and Research Department  
Louis Kollias, Director

APRIL 2009

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## **DISCLAIMER**

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

## **MICROBIOLOGICAL REPORT OF BYPASS SAMPLES IN 2008**

### **Introduction**

The Metropolitan Water Reclamation District of Greater Chicago (District) was created in 1889 to protect the source of the City of Chicago's drinking water supply – Lake Michigan. The District collects and treats wastewater from more than five million people and the industrial equivalent of another 4.5 million people in Cook County. All treated effluent from the District's water reclamation plants is discharged to the inland Chicago Area Waterway System (CAWS), tributary to the Des Plaines River which runs into the Illinois River and ultimately to the Mississippi River. The District has continued to safeguard the lake water resource not only through capital improvements such as the Tunnel and Reservoir Plan (TARP), but also through continuing water quality monitoring programs. The District operates the TARP to collect and treat sewer overflows and provides storm water management for all of Cook County. These efforts are crucial to protecting the Lake Michigan water quality while allowing the water in the inland CAWS to be used for recreational and commercial purposes.

Lake Michigan and the inland CAWS are separated by locks at the mouth of the Chicago River and on the Calumet River and gate structures to control the amount of water withdrawn from the lake, and allow release of excess river water into the lake during relatively severe storm events. Under severe storm events, when the CAWS receives excess flow which cannot be stored in the TARP, it becomes necessary to open the locks and reverse the flow (formerly known as diversion) to Lake Michigan. During the lake diversion events, the District conducts water quality monitoring to assess the effects of bypassing storm flows from the CAWS to the lake.

This report describes the results of microbiological sampling of Wilmette, Chicago and Calumet Harbors for bacteria during storm water and combined sewage bypassed by the District from the North Shore Channel (NSC) at Wilmette, Chicago River at the Chicago River Controlling Works (CRCW), and the Calumet River at the O'Brien locks to Lake Michigan as a result of exceptionally large volumes of rainfall.

### **Microbiological Results of Bypass Samples in 2008**

For the period January 1 through December 31, 2008, there were two rainstorm events severe enough to require any or all of the following:

- 1) A reversal of the NSC to Lake Michigan at Wilmette Harbor;
- 2) A reversal of the Chicago River to Lake Michigan at the CRCW;
- 3) The operation of the 95<sup>th</sup> and/or 122<sup>nd</sup> Street Pump Stations and the discharge of combined sewer overflows (CSOs) to Howard Slip and/or the Calumet River; and
- 4) A reversal of the Calumet River to Lake Michigan at the O'Brien Lock and Dam.

The first rain storm event began Friday afternoon on September 12, 2008. On September 13, 2008, between 5:00 (0500 hours) and 6:00 a.m. (0600 hours) the heaviest precipitation of the storm event was falling in the Chicago land area. By 7:30 a.m. (0730 hours), the Tunnel and Reservoir Plan (TARP) known as “Deep Tunnel” was full, holding 2.5 billion gallons of water. The O’Hare CUP Reservoir (near Elmhurst Road, north of Higgins), was at 90% storage capacity of 350 million gallons. On the south end of the system, the Thornton Transitional Reservoir (I-294 & Halsted) holding 2.2 billion gallons of storm water was 50% full.

The Cook County service area was drenched with average precipitation totaling over 6.83 inches, and localized rainfall up to 9.5 inches, between 1:30 p.m. (1330 hours) Friday afternoon (September 12, 2008) and 4:15 p.m. (1615 hours) on Sunday afternoon (September 14, 2008). The District estimated that over 100 billion gallons of water fell from the sky across the region of Cook County causing the bypass discharges to Lake Michigan. On September 15, 2008, the District’s meteorological services issued an “all clear” which signified the end of the heavy rain-fall weather event. Nearly 72 billion gallons of storm water was managed or contained by the District through its TARP system, and discharges from Lockport Powerhouse and Controlling Works in the southwest, and released to Lake Michigan. The actual number of gallons of storm water released to Lake Michigan through the gates at Wilmette, Navy Pier and Calumet during the wet weather event from Saturday, September 13th through Tuesday, September 16th was 11.2 billion.

The second storm event began in the morning of Saturday, December 27, 2008. On December 27, 2008, between 12:55 a.m. (0055 hours) and 11:59 p.m. (2329 hours), 1.20 inches of rain fell on the melting snow that covered the frozen ground in Cook County. The heaviest precipitation of the storm event fell in the south Cook County area, totaling 1.63 inches on December 27, 2008. The flow of snow melt and storm runoff became problematic only at the Wilmette Gate of the NSC at Wilmette Harbor where at 9:55 a.m. (0955 hours) a diversion was made to Lake Michigan. The diversion continued until 10:30 a.m. (1030 hours) on December 28, 2008, discharging 480.8 million gallons of storm water and CSO to Lake Michigan.

The Chicago River backflow to Lake Michigan sampling locations are shown in [Figure 1](#). Samples collected in NSC, Chicago River and Lake Michigan were analyzed for *E. coli* (EC) using the Quanti-Tray/2000 (IDEXX Laboratories, Inc., Westbrook, ME). The Calumet River backflow to Lake Michigan sampling locations are shown in [Figure 2](#). All samples collected during and after the discharges to Little Calumet River were analyzed for fecal coliform (FC) bacteria (Method 9222D *Standard Methods*, 18<sup>th</sup> edition). The relevant information about the discharges and the microbiological sampling results are described below.

## **Wilmette Harbor**

On September 13, 2008, at 6:18 a.m. (0618 hours), the Wilmette Gate of the NSC (near the Baha’i Temple) was opened, and the District began the reversal to the Lake. Approximately 1 billion gallons of storm water was flowing to Wilmette Harbor per hour. Shortly after the discharge from the Wilmette Gate Pump Station began, water samples were collected for bacteria analyses, at approximately 30-minute intervals. Twelve samples were collected during the



FIGURE 1: CHICAGO RIVER BACKFLOW TO LAKE MICHIGAN SAMPLING LOCATIONS

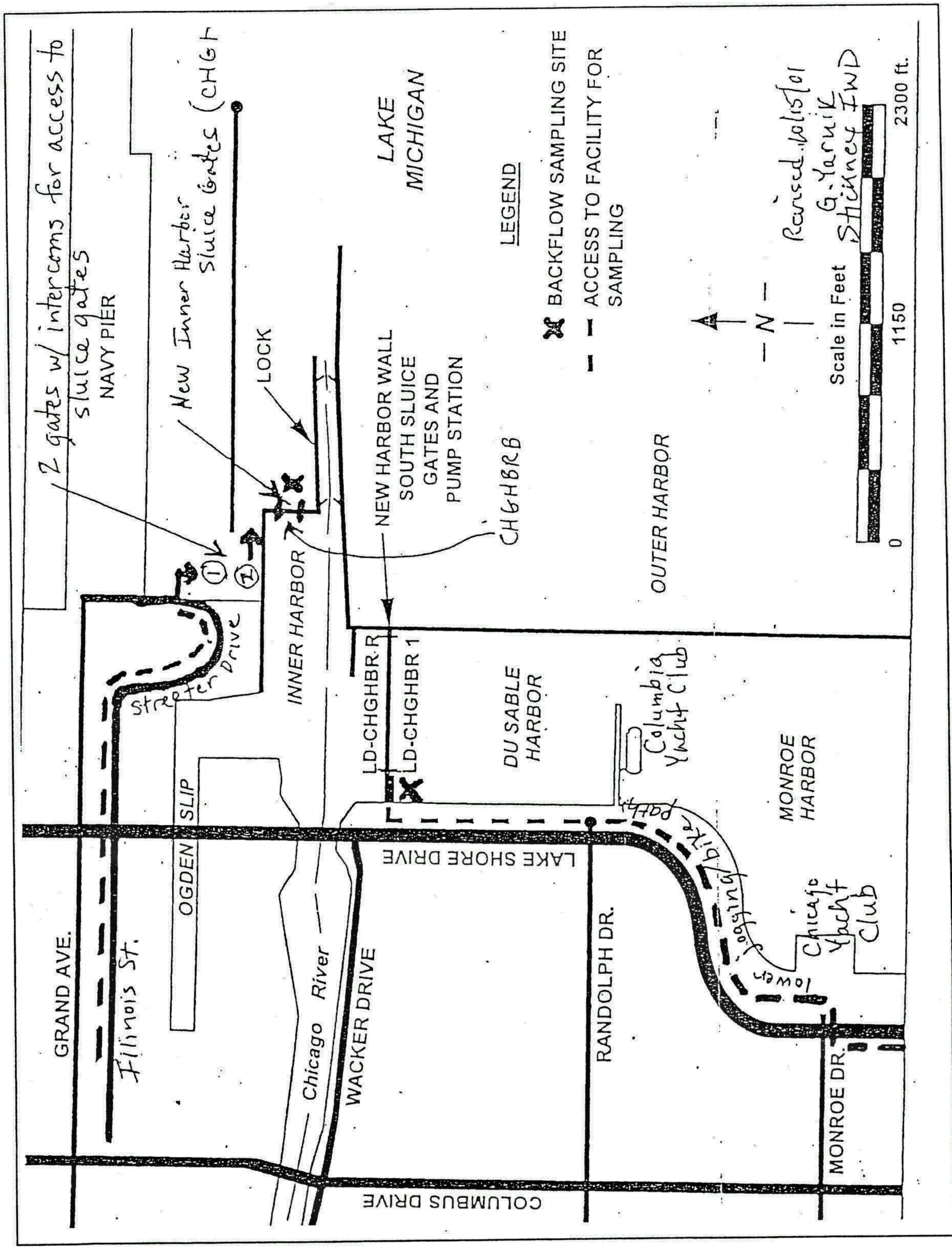
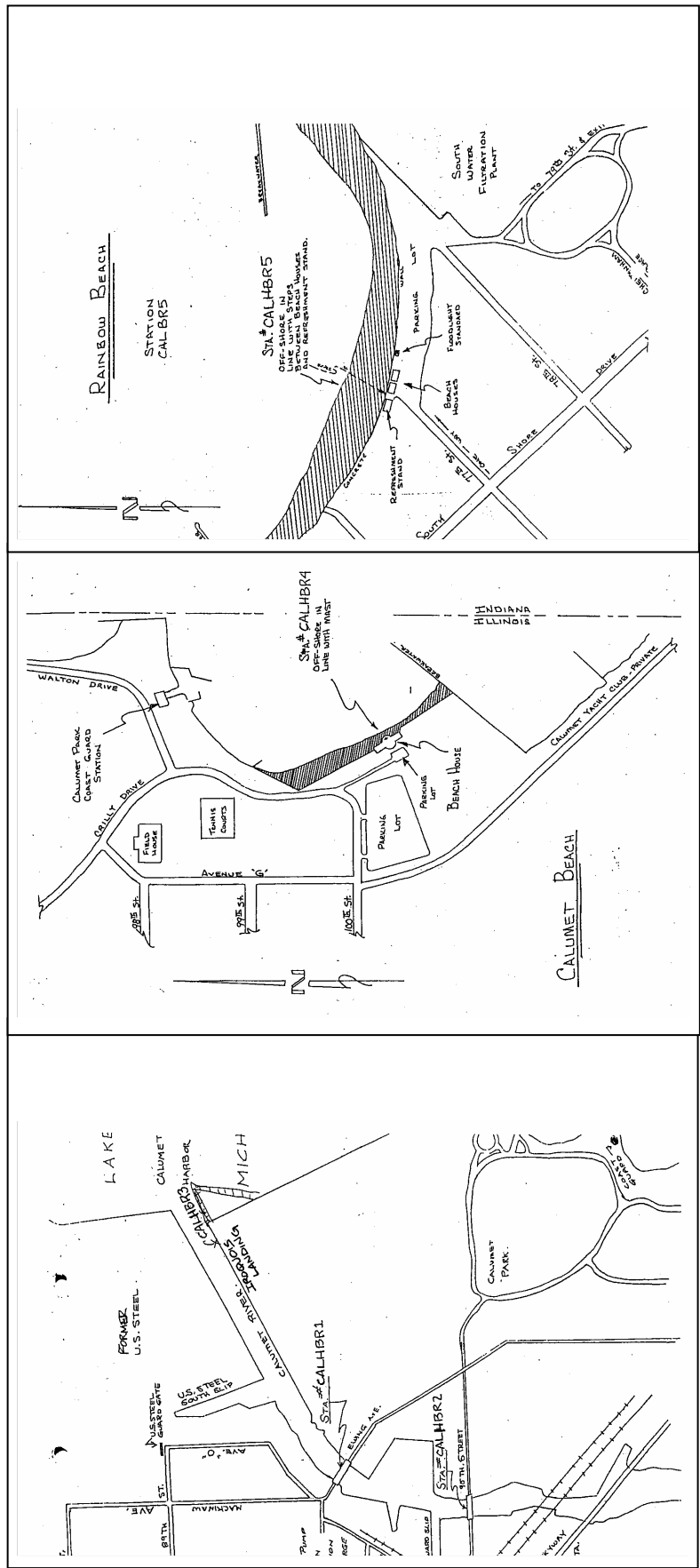


FIGURE 2: CALUMET RIVER BACKFLOW TO LAKE MICHIGAN SAMPLING LOCATIONS



discharge on September 13, 2008. One water sample was collected on September 14 and another sample on September 15, 2008. The EC results are shown in Table 1.

On December 27, 2008, a highly unusual winter weather storm event delivered an average of one inch of rainfall on the melting snow in the north area of Cook County. Nearly a half a foot of packed snow, and frozen ground, caused additional runoff with no capacity for natural ground infiltration. The runoff caused the water level in the NSC to rise quickly. A discharge of the collecting water was made to Lake Michigan starting at 9:55 a.m. (0955 hours) and continued, for 26 hours and 33 minutes, into the morning of Sunday, December 28, 2008. Shortly after the discharge from the Wilmette Sluice Gate at the NSC began, water samples were collected for bacteria analyses, continuing at approximately 30-minute intervals for the first six hours of the event. Twelve samples were collected during the discharge on December 27, 2008. One water sample was collected on December 28, 2008. The EC results are shown in Table 2.

### **Chicago River Controlling Works**

It should be noted that due to the voluminous precipitation on September 13, 2008, the CRCW Gate (near Navy Pier) was opened; reversing the flow of storm water and combined sewage bypass water to Lake Michigan. The CRCW was opened at 10:15 a.m. (1015 hours) on September 13, 2008, releasing approximately 2.5 billion gallons per hour. During and after the discharges from the CRCW, eleven water samples were collected at approximately 30-minute intervals on September 13, 2008. One water sample was collected on September 14, 2008, from the CRCW. The EC results are shown in Table 3.

### **DuSable Harbor**

Water samples were also collected at the DuSable Harbor Sluice Gates due to the back-flow to Lake Michigan at the CRCW. Six samples were collected on September 13, 2008. One sample was collected on September 14 and 15, 2008, from the river side of DuSable Harbor Sluice Gates. The EC results are shown in Table 4.

### **Calumet Area Pump Station**

As a result of the record rainfall on September 13, 2008, the O'Brien Gate located near 130th & Torrence Avenue was opened at 5:44 p.m. (1744 hours) reversing the Calumet River to Lake Michigan at an approximate rate of 700 million gallons per hour. Storm related sampling in the District's south service area began with discharge from the 95<sup>th</sup> Street Pump Station. The first water sample was collected at 1:00 p.m. (1300 hours) on September 14, 2008. Twenty-one samples were taken at the 95<sup>th</sup> Street Bridge, and eighteen samples were taken at the Ewing Avenue Bridge from the Calumet River at approximately 30-minute intervals. Post-discharge samples were also taken from Lake Michigan at three Chicago area beaches adjacent to the mouth of the Calumet Harbor. The FC results are shown in Tables 5 and 6. The EC results for the beach monitoring samples are shown in Table 7.

TABLE 1: WILMETTE HARBOR (WILHBR 1)<sup>1</sup> BYPASS MONITORING BACTERIA RESULTS

LIMS Number	Sample Date	Sample Time <sup>2</sup>	<i>E. coli</i> <sup>3</sup> MPN/100mL
5547645	9/13/08	07:50	61,300
5547646	9/13/08	08:20	120,000
5547647	9/13/08	08:50	86,600
5547648	9/13/08	09:20	105,000
5547649	9/13/08	09:50	86,600
5547650	9/13/08	10:20	92,100
5547651	9/13/08	10:50	98,000
5547652	9/13/08	11:20	68,700
5547653	9/13/08	11:50	72,700
5547654	9/13/08	12:20	72,700
5547655	9/13/08	12:50	81,600
5547656	9/13/08	13:20	57,900
5548051	9/14/08	07:25	48,800
5548754	9/15/08	09:00	17,300

<sup>1</sup>Sample Description/Sample Point - Wilmette Sluice Gate.

<sup>2</sup>Military Time.

<sup>3</sup>*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18<sup>th</sup> Edition, 1992, Most Probable Number (MPN) Method 9223B (Quanti-Tray/2000).

TABLE 2: WILMETTE HARBOR (WILHBR 1)<sup>1</sup> BYPASS MONITORING BACTERIA RESULTS

LIMS Number	Sample Date	Sample Time <sup>2</sup>	<i>E. coli</i> <sup>3</sup> MPN/100mL
5628541	12/27/08	10:00	57,900
5628542	12/27/08	10:30	7,700
5628543	12/27/08	11:00	64,900
5628544	12/27/08	11:30	105,000
5628545	12/27/08	12:00	68,700
5628546	12/27/08	12:30	112,000
5628547	12/27/08	13:00	130,000
5628548	12/27/08	13:30	141,000
5628549	12/27/08	14:00	120,000
5628550	12/27/08	14:30	130,000
5628551	12/27/08	15:00	98,000
5628552	12/27/08	15:30	86,000
5628566	12/28/08	07:25	14,100

<sup>1</sup>Sample Description/Sample Point - Wilmette Sluice Gate.

<sup>2</sup>Military Time.

<sup>3</sup>*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18<sup>th</sup> Edition, 1992, Most Probable Number (MPN) Method 9223B (Quanti-Tray/2000).

TABLE 3: CHICAGO RIVER CONTROLLING WORKS (CRCW) AT LOCKS BYPASS  
MONITORING BACTERIA RESULTS

LIMS Number	Sample Date	Sample Time <sup>1</sup>	Sample Description	Sample Point	<i>E. coli</i> <sup>2</sup> MPN/100mL
5547672	9/13/08	12:30	Chicago River at Locks	CHGHBRH	19,900
5547673	9/13/08	13:00	Chicago River at Locks	CHGHBRH	34,500
5547674	9/13/08	13:30	Chicago River at Locks	CHGHBRH	64,900
5547675	9/13/08	14:00	Chicago River at Locks	CHGHBRH	155,000
5547676	9/13/08	14:30	Chicago River at Locks	CHGHBRH	105,000
5547677	9/13/08	15:00	Chicago River at Locks	CHGHBRH	242,000
5547678	9/13/08	15:30	Chicago River at Locks	CHGHBRH	141,000
5547681	9/13/08	17:50	Chicago River at Locks	CHGHBRH	141,000
5547682	9/13/08	18:50	Chicago River at Locks	CHGHBRH	105,000
5547683	9/13/08	19:50	Chicago River at Locks	CHGHBRH	173,000
5547684	9/13/08	20:50	Chicago River at Locks	CHGHBRH	> <sup>3</sup> 242,000
5548102	9/14/08	12:50	Chicago River at Locks	CHGHBRH	173,000

<sup>1</sup>Military Time.

<sup>2</sup>*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18<sup>th</sup> Edition, 1992, Most Probable Number (MPN) Method 9223B (Quanti-Tray/2000).

<sup>3</sup>Greater than (>) the reported value.

TABLE 4: DUSABLE HARBOR BYPASS MONITORING BACTERIA RESULTS

LIMS Number	Sample Date	Sample Time <sup>1</sup>	Sample Description	Sample Point	<i>E. coli</i> <sup>2</sup> MPN/100mL
5547679	9/13/08	16:30	Inner DuSable Harbor Sluice Gate	CHGHBR 1	98,000
5547680	9/13/08	17:00	Inner DuSable Harbor Sluice Gate	CHGHBR 1	130,000
5547685	9/13/08	18:20	Inner DuSable Harbor Sluice Gate	CHGHBR 1	242,000
5547686	9/13/08	19:20	Inner DuSable Harbor Sluice Gate	CHGHBR 1	> <sup>3</sup> 242,000
5547687	9/13/08	20:20	Inner DuSable Harbor Sluice Gate	CHGHBR 1	242,000
5547688	9/13/08	21:20	Inner DuSable Harbor Sluice Gate	CHGHBR 1	199,000
5548103	9/14/08	13:20	River Side/DuSable Harbor Sluice Gate	CHGHBR	242,000
5548847	9/15/08	12:20	River Side/DuSable Harbor Sluice Gate	CHGHBR	6,870

<sup>1</sup>Military Time.

<sup>2</sup>*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18<sup>th</sup> Edition, 1992, Most Probable Number (MPN) Method 9223B (Quanti-Tray/2000).

<sup>3</sup>Greater than (>) the reported value.

TABLE 5: CALUMET AREA PUMPING STATION BYPASS MONITORING BACTERIA RESULTS  
FROM THE 95<sup>th</sup> STREET AT LITTLE CALUMET RIVER

LIMS Number	Sample Date	Sample Time <sup>1</sup>	Sample Description/ Sample Point	Fecal Coliform <sup>2</sup> CFU/100mL
5548134	9/14/08	13:00	95th St. at Little Calumet River/CALHBR 2	4,000 E <sup>3</sup>
5548135	9/14/08	13:30	95th St. at Little Calumet River/CALHBR 2	27,000
5548136	9/14/08	14:00	95th St. at Little Calumet River/CALHBR 2	3,000 E
5548137	9/14/08	14:30	95th St. at Little Calumet River/CALHBR 2	12,000 E
5548138	9/14/08	15:00	95th St. at Little Calumet River/CALHBR 2	13,000
5548139	9/14/08	15:30	95th St. at Little Calumet River/CALHBR 2	2,000
5548140	9/14/08	16:00	95th St. at Little Calumet River/CALHBR 2	5,400
5548141	9/14/08	16:30	95th St. at Little Calumet River/CALHBR 2	1,000 E
5548142	9/14/08	17:00	95th St. at Little Calumet River/CALHBR 2	5,200
5548143	9/14/08	17:30	95th St. at Little Calumet River/CALHBR 2	2,400
5548144	9/14/08	18:00	95th St. at Little Calumet River/CALHBR 2	22,000
5548145	9/14/08	18:30	95th St. at Little Calumet River/CALHBR 2	27,000
5548123	9/14/08	18:45	95th St. at Little Calumet River/CALHBR 2	4,600
5548146	9/14/08	19:00	95th St. at Little Calumet River/CALHBR 2	28,000
5548147	9/14/08	19:30	95th St. at Little Calumet River/CALHBR 2	53,000
5548148	9/14/08	20:00	95th St. at Little Calumet River/CALHBR 2	53,000
5548149	9/14/08	20:30	95th St. at Little Calumet River/CALHBR 2	44,000
5548150	9/14/08	21:00	95th St. at Little Calumet River/CALHBR 2	39,000
5548151	9/14/08	21:30	95th St. at Little Calumet River/CALHBR 2	50,000
5548152	9/14/08	22:00	95th St. at Little Calumet River/CALHBR 2	44,000
5548153	9/14/08	22:30	95th St. at Little Calumet River/CALHBR 2	39,000

<sup>1</sup>Military Time.

<sup>2</sup>Fecal Coliform: Standard Methods for the Examination of Water & Wastewater, 18<sup>th</sup> Edition, 1992, Method 9222D.

<sup>3</sup>Reported value is an estimated count as the number of colonies did not fall within recommended count limits per plate.



TABLE 6: CALUMET AREA PUMPING STATION BYPASS MONITORING BACTERIA RESULTS  
FROM THE EWING AVENUE AT LITTLE CALUMET RIVER

LIMS Number	Sample Date	Sample Time <sup>1</sup>	Sample Description	Sample Point	Fecal Coliform <sup>2</sup> CFU/100mL
5548112	9/14/08	13:15	Ewing Ave. at Little Calumet River	CALHBR 1	11,000 E <sup>3</sup>
5548113	9/14/08	13:45	Ewing Ave. at Little Calumet River	CALHBR 1	38,000
5548114	9/14/08	14:15	Ewing Ave. at Little Calumet River	CALHBR 1	2,000 E
5548115	9/14/08	14:45	Ewing Ave. at Little Calumet River	CALHBR 1	9,000 E
5548116	9/14/08	15:15	Ewing Ave. at Little Calumet River	CALHBR 1	6,000
5548117	9/14/08	15:45	Ewing Ave. at Little Calumet River	CALHBR 1	2,000
5548118	9/14/08	16:15	Ewing Ave. at Little Calumet River	CALHBR 1	1,300 E
5548119	9/14/08	16:45	Ewing Ave. at Little Calumet River	CALHBR 1	10,000 E
5548120	9/14/08	17:15	Ewing Ave. at Little Calumet River	CALHBR 1	1,000 E
5548121	9/14/08	17:45	Ewing Ave. at Little Calumet River	CALHBR 1	2,100
5548122	9/14/08	18:15	Ewing Ave. at Little Calumet River	CALHBR 1	8,000 E
5548125	9/14/08	19:15	Ewing Ave. at Little Calumet River	CALHBR 1	18,000 E
5548126	9/14/08	19:45	Ewing Ave. at Little Calumet River	CALHBR 1	48,000
5548127	9/14/08	20:15	Ewing Ave. at Little Calumet River	CALHBR 1	43,000
5548128	9/14/08	20:45	Ewing Ave. at Little Calumet River	CALHBR 1	34,000
5548129	9/14/08	21:15	Ewing Ave. at Little Calumet River	CALHBR 1	45,000
5548130	9/14/08	21:45	Ewing Ave. at Little Calumet River	CALHBR 1	50,000
5548131	9/14/08	22:15	Ewing Ave. at Little Calumet River	CALHBR 1	29,000

<sup>1</sup>Military Time.

<sup>2</sup>Fecal Coliform: Standard Methods for the Examination of Water & Wastewater, 18<sup>th</sup> Edition, 1992, Method 9222D.

<sup>3</sup>Reported value is an estimated count as the number of colonies did not fall within recommended count limits per plate.

TABLE 7: CALUMET AREA PUMPING STATION BYPASS MONITORING BACTERIA RESULTS  
FROM THREE CHICAGO AREA BEACHES AND THE O'BRIEN LOCKS

LIMS Number	Sample Date	Sample Time <sup>1</sup>	Sample Description/Sample Point	Fecal Coliform <sup>2</sup> CFU/100mL	<i>E. coli</i> <sup>3</sup> MPN/100mL
5548157	9/14/08	23:15	Iroquois Landing, Lake Michigan/CALHBR 3	120	98
5548537	9/15/08	8:45	Iroquois Landing, Lake Michigan/CALHBR 3	450	171
5548156	9/14/08	23:00	Calumet Beach, Lake Michigan/CALHBR 4	1,800	1,260
5548538	9/15/08	8:30	Calumet Beach, Lake Michigan/CALHBR 4	3,500	2,760
5548158	9/14/08	23:30	Rainbow Beach, Lake Michigan/CALHBR 5	880	435
5548539	9/15/08	9:15	Rainbow Beach, Lake Michigan/CALHBR 5	2,900	1,080
5547691	9/14/08	0:45	O'Brien Locks/CALHBR 6	NA <sup>4</sup>	301

<sup>1</sup>Military Time.

<sup>2</sup>Fecal Coliform: Standard Methods for the Examination of Water & Wastewater, 18<sup>th</sup> Edition, 1992, Method 9222D.

<sup>3</sup>*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18<sup>th</sup> Edition, 1992, Most Probable Number (MPN). Method 9223B (Quanti-Tray/2000).

<sup>4</sup>NA: No Analysis Performed.